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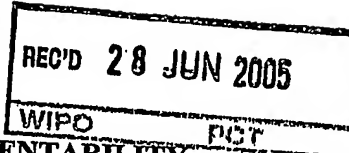WIPO   PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	
P6282PC00	**FOR FURTHER ACTION** See Form PCT/IPEA/416

International application No.	International filing date (day/month/year)	Priority date (day/month/year)
PCT/SE 2004/000847	02-06-2004	10-06-2003

International Patent Classification (IPC) or national classification and IPC

H04N 7/50

Applicant

Strömberg, Jan-Olov et al

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of __3__ sheets, including this cover sheet.

3. This report is also accompanied by ANNEXES, comprising:

   a. ☒ *(sent to the applicant and to the International Bureau)* a total of __4__ sheets, as follows:

   ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

   ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) _____ , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

   ☒ Box No. I   Basis of the report

   ☐ Box No. II   Priority

   ☐ Box No. III   Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

   ☐ Box No. IV   Lack of unity of invention

   ☒ Box No. V   Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

   ☐ Box No. VI   Certain documents cited

   ☐ Box No. VII   Certain defects in the international application

   ☐ Box No. VIII   Certain observations on the international application

Date of submission of the demand	Date of completion of this report
23-12-2004	14-06-2005
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 667 72 88	Authorized officer Jesper Bergstrand/MN Telephone No. +46 8 782 25 00

Form PCT/IPEA/409 (cover sheet) (January 2004)

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/SE 2004/000847

Box No. I	Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

   ☐ This report is based on a translation from the original language into the following language _____ , which is the language of a translation furnished for the purposes of:

   ☐ international search (under Rules 12.3 and 23.1(b))

   ☐ publication of the international application (under Rule 12.4)

   ☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

   ☐ the international application as originally filed/furnished

   ☒ the description:

   pages   1-26

   pages* _____ as originally filed/furnished

   pages* _____ received by this Authority on _____

   pages* _____ received by this Authority on _____

   ☒ the claims:

   pages _____

   pages* _____ as originally filed/furnished

   pages* 27-30 _____ as amended (together with any statement) under Article 19

   pages* _____ received by this Authority on   20-05-2005

   pages* _____ received by this Authority on _____

   ☒ the drawings:

   pages   1-6

   pages* _____ as originally filed/furnished

   pages* _____ received by this Authority on _____

   pages* _____ received by this Authority on _____

   ☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

   ☐ the description, pages _____

   ☐ the claims, Nos. _____

   ☐ the drawings, sheets/figs _____

   ☐ the sequence listing *(specify)*: _____

   ☐ any table(s) related to the sequence listing *(specify)*: _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

   ☐ the description, pages _____

   ☐ the claims, Nos. _____

   ☐ the drawings, sheets/figs _____

   ☐ the sequence listing *(specify)*: _____

   ☐ any table(s) related to the sequence listing *(specify)*: _____

* *If Item 4 applies, some or all of those sheets may be marked "superseded."*

| Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |

1. Statement

Novelty (N)	Claims	1-15		YES
	Claims			NO
Inventive step (IS)	Claims	1-15		YES
	Claims			NO
Industrial applicability (IA)	Claims	1-15		YES
	Claims			NO

2. Citations and explanations (Rule 70.7)

Documents cited in the International Search Report:
D1: EP 0888013 A
D2: EP 0921685 A
D3: EP 0399487 A

The cited documents represent the general state of the art.
The invention defined in claims 1-15 is not disclosed by any
of these documents.
The cited prior art does not give any indication that would
lead a person skilled in the art to the claimed method for
compressing data of an image, which image is part of a
sequence of images, comprising the steps of: transforming data
of a frame in said sequence into a first sequence of real
numbers by using a wavelet transform method; quantizing said
first sequence of real numbers of said frame to obtain a first
sequence of integers; quantizing said first sequence of
integers of said frame using a predicted sequence of integers
representing said first sequence of integers to produce a
second sequence of integers where, for each coefficient in
said second sequence, a relation between an integer in said
first sequence of integers of said frame with a corresponding
integer in a reference image and the corresponding integer in
the predicted sequence based on an evaluation value for said
relation is selected, wherein said predicted sequence is based
on at least one previous frame in said sequence of images; and
encoding said integers of said second sequence of said frame
into a stream of bits representing the compressed sequence of
integers of said frame.

Therefore, the claimed invention is not obvious to a person
skilled in the art.
Accordingly, the invention defined in claims 1-15 is novel and
is considered to involve an inventive step.
The invention is industrially applicable.

New claims

1. Method for compressing data of an image, which image is part of a sequence of images, comprising the steps of:

transforming data of a frame in said sequence into a first sequence of real numbers by using an wavelet transform method;

quantizing said first sequence of real numbers of said frame to obtain a first sequence of integers;

quantizing said first sequence of integers of said frame using a predicted sequence of integers representing said first sequence of integers to produce a second sequence of integers where, for each coefficient in said second sequence, a relation between an integer in said first sequence of integers of said frame with a corresponding integer in a reference image and the corresponding integer in the predicted sequence based on a evaluation value for said relation is selected, wherein said predicted sequence is based on at least one previous frame in said sequence of images; and

encoding said integers of said second sequence of said frame into a stream of bits representing the compressed sequence of integers of said frame.

2. Method according to claim 1, wherein the step of selecting comprises the step of

for each coefficient of said second sequence of integers, comparing a first relation between the integer of said first sequence of integers of said frame and the corresponding integer of a reference frame and a second relation between said integer and the corresponding integer of the predicted sequence; and

determining the evaluation value for each relation based on respective relation in encoded form.

3. Method according to claim 2, wherein the step of determining comprises the step of

determining the absolute value of respective relation, wherein the evaluation value for each relation is set to the corresponding absolute value.

4. Method according to claim 3, wherein the step of selecting comprises the step of selecting the relation having the lowest absolute value.

5. Method according to claim 1 or 2, wherein the step of selecting comprises the step of:

selecting said relation according to

$$c'=c\text{-}r \qquad \text{if } p=r \text{ or } \frac{c-r}{p-r}<\frac{1}{2},$$
$$c'=c\text{-}p \qquad \text{otherwise}$$

, where c' is an integer of the second sequence, p is the corresponding integer of the predicted sequence, c is the corresponding integer of the first sequence of a current frame, and r is the corresponding integer of a reference frame.

6. Method according to claim 3, wherein the step of quantizing said first sequence of integers of said frame further comprises the step of: if

$$p \neq r \text{ and } -\frac{1}{2} \le \frac{c-r}{p-r} < \frac{3}{2},$$

associating a control bit identifying the selected relation.

7. Method according to anyone of preceding claims, further comprising the step of:

storing said stream of bits as a compressed representation of said sequence of said frame.

8. Method according to any one of the preceding claims, further comprising decompressing said compressed sequence by inverting the steps of transforming, quantizing said first sequence of real numbers, quantizing said first sequence of integers of said frame, and decoding in reverse order.

9. Method according to claim 8, wherein the step of inverting the step of quantizing said first sequence of integers comprises the steps of:
reconstructing a sequence of integers of a current frame according to

$$c = c' + r \qquad \text{if } p = r \text{ or } \frac{c-r}{p-r} < \frac{1}{2},$$
$$c = c' + r \qquad \text{otherwise}$$

, where c' is an integer of the compressed sequence, r is the corresponding integer of the reference frame, and c is the corresponding integer of the reconstructed sequence representing the first sequence of the current frame

10. Method according to claim 9, wherein the step of reconstructing comprises the step of

if

$$p \neq r \text{ and } -\frac{1}{2} \le \frac{c-r}{p-r} < \frac{3}{2},$$

where p an integer of the predicted sequence and c is the corresponding integer of the current frame, using the associated control bit to identify the relation between an integer, c', of the compressed sequence, the corresponding integer, r, of the reference frame, and the corresponding integer, c, of the reconstructed sequence representing the first sequence of the current frame.

11. Method according to claim 9 or 10, further comprising the step of storing the reconstructed sequence of integers.

12. Method according to any one of preceding claims, wherein the predicted sequence is a simulated reconstructed sequence of a previous frame.

13. System for compressing and decompressing data of an image, which image is part of a sequence of images, comprising
a storage device for storing data;
transform means arranged to transform a frame of data in said sequence into a first sequence of real numbers by using an wavelet transform method;
compression processing means, comprising

quantization means arranged to quantize said first sequence of real numbers to produce a first sequence of integers;

adaptive quantization means arranged to quantize said first sequence of integers of said frame using a predicted sequence representing said first sequence of integers to produce a second sequence of integers where, for each coefficient in said second sequence, a relation between an integer in said first sequence of integers of said frame with a corresponding integer in a reference image and the corresponding integer in the predicted sequence based on a evaluation value for said relation is selected, wherein said predicted sequence is based on at least one previous frame in said sequence of images; and

encoding means arranged to encode said integers of said second sequence of said frame into a stream of bits representing the compressed sequence of integers of said frame.

14. System according to claim 13, further comprising

reconstruction means comprising

decoding means arranged to decode a bit stream representing a compressed sequence of integers into a third sequence of integers;

inverse adaptive quantization means arranged to inversely quantize said fourth sequence of integers to produce a reconstructed first sequence of integers by using the predicted sequence of integers representing said first sequence of integers; and

inverse quantization means arranged to inversely quantize said reconstructed first sequence of integers to produce a second sequence of integers second sequence of real numbers; and

inverse transform means arranged to inversely transform said sequence of real number to a reconstructed frame of data.

15. Computer readable medium comprising instructions for bringing a computer to perform the method according to any one of the claims 1-12.